

nation for vision at night, and an appropriate pattern recognition system, this becomes possible. Similarly, the use of three dimensional cameras based on modulated waves or range-gated pulsed light methods combined with pattern recognition systems are now possible based on the teachings of the inventions disclosed herein and the commonly assigned patents and patent applications referenced above.

[0064] 9. Information About an Occupying Item

[0065] As discussed above, it is desirable to obtain information about an occupying item in a vehicle in order to control a component in the vehicle based on the characteristics of the occupying item. For example, if it were known that the occupying item is inanimate, an airbag deployment system would generally be controlled to suppress deployment of any airbags designed to protect passengers seated at the location of the inanimate object.

[0066] When the occupying item is human, in some instances the information about the occupying item can be the occupant's position, size and weight. Each of these properties can have an effect on the control criteria of the component. One system for determining a deployment force of an air bag system is described in U.S. Pat. No. 6,199,904 (Doddall). This system provides a reflective surface in the vehicle seat that reflects microwaves transmitted from a microwave emitter. The position, size and weight of a human occupant are said to be determined by calibrating the microwaves detected by a detector after the microwaves have been reflected from the reflective surface and pass through the occupant.

[0067] 10. Child Seat Detection Prior Art

[0068] With respect to prior art related to the detection of child restraining seats, U.S. Pat. No. 5,605,348 (Blackburn et al.) describes method and apparatus for sensing a rearward facing child restraining seat in which a child restraining seat identification tag is secured to the child restraining seat and an antenna coil is energized to transmit an EMF field. The tag is made of an amorphous material that radiates a return EMF signal that is received by the antenna coil. The system determines whether a rear-facing child seat is present based on the presence of the return EMF signal, which is received only if the tag mounted to bottom front of the child seat is within a certain distance from the antenna coil mounted in the back portion of the seat. Drawbacks of the system of Blackburn et al. are that a special tag must be incorporated into the child seat in order to detect the same, the system cannot differentiate between other similarly tagged objects and the system relies on the proper placement of the tag on the child seat. In other words, if the tag were to be improperly placed on the child seat, then the system would not accurately determine the presence and orientation of the same. Also, the system of Blackburn et al. does not generate, e.g., via the antenna coil, a signal based on the contents of the seat which is different depending on the contents of the seat, i.e., the signal for an adult occupant is different from the signal for a forward-facing child seat which is different from the signal for a rear-facing child seat, etc., and analyze the same in order to determine whether the contents of the seat include a child seat in a rear-facing position. Rather, the ENIF field generated by the tag is the same signal, and only the power output is varied. Thus, either no signal (no EMF field) will be generated representing the absence of a rear-facing child seat or a signal (an EMF field) will be generated representing the presence of a rear-facing child seat.

[0069] 11. Summary

[0070] From the above discussion, it can be seen that the addition of sophisticated pattern recognition means to any of the illumination and/or reception technologies for use in a motor vehicle permits the development of a host of new products, systems or capabilities heretofore not available and as described in more detail below.

OBJECTS AND SUMMARY OF THE INVENTION

[0071] Briefly, the claimed inventions are methods and arrangements for obtaining information about an object in a vehicle. This determination is used in various methods and arrangements for, for example, controlling occupant protection devices in the event of a vehicle crash.

[0072] The determination can also be used in various methods and arrangements for, controlling heating and air-conditioning systems to optimize the comfort for any occupants, controlling an entertainment system as desired by the occupants, controlling a glare prevention device for the occupants, preventing accidents by a driver who is unable to safely drive the vehicle and enabling an effective and optimal response in the event of a crash (either oral directions to be communicated to the occupants or the dispatch of personnel to aid the occupants) as well as many others. Thus, one objective of the invention is to obtain information about occupancy of a vehicle before, during and/or after a crash and convey this information to remotely situated assistance personnel to optimize their response to a crash involving the vehicle and/or enable proper assistance to be rendered to the occupants after the crash.

[0073] Principle objects and advantages of the claimed invention are:

[0074] 1. To obtain information about an object in a vehicle using resonators or reflectors arranged in association with the object, such as the position of the object and the orientation of the object.

[0075] 2. To provide a system designed to determine the orientation of a child seat using resonators or reflectors arranged in connection with the child seat.

[0076] 3. To provide a system designed to determine whether a seatbelt is in use using resonators and reflectors, for possible use in the control of a safety device such as an airbag.

[0077] 4. To provide a system designed to determine the position of an occupying item of a vehicle using resonators or reflectors, for possible use in the control of a safety device such as an airbag.

[0078] 5. To provide a system designed to determine the position of a seat using resonators or reflectors, for possible use in the control of a vehicular component or system which would be affected by different seat positions.

[0079] In order to achieve these objects, a vehicle including a system for obtaining information about an object in the vehicle, comprises at least one resonator or reflector arranged in association with the object, each resonator emitting an energy signal upon receipt of a signal at an excitation frequency, a transmitter device for transmitting